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RTCA Special Committee 186, Working Group 3

ADS-B 1090 MOPS, Revision A

Meeting #11

Action Item 7-3

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TIS-B GROUND ARCHITECTURE

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At the seventh meeting of WG-3, Action Item 7-3 was identified to outline the requirements for the ground processing for TIS-B.

This Working Paper presents a briefing that identifies ground processing requirements that should be included in the revised 1090 MHz MOPS.

Introduction

- MOPS requirements in 2.2 will address TIS-B formats and airborne processing
- TIS-B ground requirements not covered
- Need to include advice on TIS-B ground architecture and processing
  - Similar to approach taken for ATC surveillance ADS-B ground architecture in Appendix D
  - To be included in revision to Appendix D

Ground TIS-B Operation Recommendations

- TIS-B on 1090 MHz only provided for aircraft that are not equipped with extended squitter
- For stand alone operation with a local radar
  - Limit maximum range to provide reasonable low-altitude coverage
  - Minimize duplicate message transmissions in regions of overlapping coverage
- For multi-sensor operation with netted surveillance data
  - Achieve same goals as for standalone
- Use Mode S ground surveillance data when available
  - More reliable correlation of ADS-B and ground data
- Provide management message transmissions to define boundary of service area
- When operating as an ADS-B gateway, use ADS-B data in preference to radar data

1090 MHz TIS-B Only on Aircraft Not Equipped with Extended Squitter

- Best technique to determine aircraft equipage is to monitor 1090 MHz for extended squitters
  - Downlink of Capability message not sufficient
  - Downlink cannot determine active squitter state
  - Downlink does not apply to non-transponder devices
- Above implies that
  - TIS-B station must receive as well as transmit
  - TIS-B antenna site should be located to have the same coverage as surveillance system used as input to TIS-B

Maximum Range Limit

- **Ground surveillance low altitude coverage limited by earth's curvature, e.g.with 0.5 degree screening angle low altitude limit is**
  - **4000 feet at 50 NM**
  - **12000 feet at 100 NM**

- **Range of TIS-B service should be limited to achieve desired low altitude coverage**

Minimize Duplicate Transmissions

- In high density areas, surveillance data on a particular aircraft may be available from many radars

- Overlap between adjacent stations would be the minimum needed to ensure continuity of service across a boundary
  - Avoids unnecessary channel activity

Ground Radar Data Selection

- Mode S radar data preferable where available
  - Reliable correlation with ADS-B data based on 24-bit address for transponder based extended squitter
  - Correlation must also include position reasonableness test to handle duplicate 24-bit addresses
- Mode A/C radar data may be used
  - Position correlation only since Mode A code not available via ADS-B
- Once correlation is made between extended squitter and Mode A/C, 24-bit address should be associated with Mode A/C track for future correlations
  - Will reduce track splits

Management Messages

- **Management messages inform aircrew of the limit of TIS-B service**
  - **Similar to status messages provide by TIS**
  - **Useful as ‘keep alive” to confirm TIS-B service**

- **Management messages useful for selecting source of coarse messages in overlapping coverage**
  - **Can improve track stability**

ADS-B Gateway Operation

- Aircraft note equipped with extended squitter but equipped with other ADS-B technology will be included in TIS-B service
  - TIS-B service will be based on radar data in basic TIS-B configuration
- An ADS-B gateway implies the ability to receive ADS-B messages from other technology
- When operating as a gateway, TIS-B surveillance will be based on ADS-B rather than radar data
  - Higher quality than radar